

VISBYELLA—A NEW GENUS OF RESSERELLID BRACHIOPOD

by V. G. WALMSLEY, A. J. BOUCOT, C. W. HARPER, and
N. M. SAVAGE

ABSTRACT. A new genus of resserellid brachiopod, *Visbyella*, is erected based on *Orthis visbyensis* Lindström 1861 as type species. *Visbyella* is distinguished from both *Resserella* and *Fascicostella* by its hypereline dorsal interarea, its extroverted (dorsally facing) trilobed cardinal process, the presence of an apical plate, and by its tendency to have the median ridge in the brachial valve elevated anteriorly. *Fascicostella* is distinguished from both *Visbyella* and *Resserella* by its distinctly fasciculate ribbing.

Dalmanella wisbyensis var. *nana* McLearn 1924 and *Parmorthis visbyensis* var. *pygmaea* Whittard and Barker 1950 are both considered to be distinct species and are assigned to *Visbyella* together with a new species *V. cumnockensis*, which is here described from New South Wales.

The known distribution of *Visbyella* is in beds of Silurian (Upper Llandovery and Wenlock) age from Gotland, Britain, Nova Scotia, southern New Brunswick, and New South Wales. Both *Resserella* and *Visbyella* make their first appearance in the Upper Llandovery. The more complex morphology of *Visbyella* seems to us to be more easily derived from *Resserella* than vice versa.

RESULTS of a study of some twenty species of resserellid brachiopods by Walmsley, in collaboration with Boucot, including two species from the Arisaig area of Nova Scotia which have recently been restudied by Harper (1964, C.I.T. Ph.D. thesis *The Brachiopods of the Arisaig Series (Silurian–Lower Devonian) of Nova Scotia*), are being prepared for joint publication.

In this joint work, it was proposed to erect a new sub-family to include all these species, assigned to *Resserella* [*Parmorthis*], *Fascicostella* and a new genus *Visbyella*, based on '*Orthis visbyensis* Lindström. To *Visbyella* were assigned *Dalmanella wisbyensis* var. *nana* McLearn, which Harper's study has confirmed as indeed closely related to *O. visbyensis*, though now considered to be a separate species, and *Parmorthis visbyensis* var. *pygmaea* Whittard and Barker, also considered to be a distinct species.

Meanwhile, Savage independently recognized a new species of septate dalmanellid in material from New South Wales, which he proposed to describe and assign to a new genus based on this species. His species is close to *Visbyella nana* and is here assigned to the new genus *Visbyella* and described as a new species *V. cumnockensis*.

The fortunate circumstances of a recent visit to Australia by Boucot, brought to light the coincidence of interest and resulted in the collaboration of the present authors in here erecting the genus *Visbyella* and presenting descriptions of *V. visbyensis*, *V. nana*, and the new species *V. cumnockensis*.

SYSTEMATIC DESCRIPTIONS

Superfamily ENTELETACEA Waagen 1884

[*nom. transl.* Alichova, 1960, p. 193 (*ex Entelitinae* Waagen 1884, p. 548)]

Family DALMANELLIDAE Schuchert 1913

Genus VISBYELLA gen. nov.

Type species. *Orthis visbyensis* Lindström 1861, p. 366, pl. xii, fig. 8.

[*Palaeontology*, Vol. 11, Part 2, 1968, pp. 306–16, pls. 60–62.]

Diagnosis. Plano-convex to slightly concavo-convex or very unequally biconvex, dalmanellids commonly having a strongly incurved pedicle-valve beak. Apical plate present. Cardinal process trilobed and extroverted (dorsally facing). Interarea of brachial valve hypercline. Median ridge in brachial valve elevated into an anterior septum in some species.

Comparison. *Visbyella* is closest to *Resserella* and has a similar plano-convex profile and the distinctive asymmetrical pattern of costellae bifurcation in the medial region of the brachial valve (see Walmsley 1965, pp. 456–7), as well as similar brachiophores and muscle fields.

It is distinguished from *Resserella* by its hypercline interarea in the brachial valve, its extroverted (dorsally facing) trilobed cardinal process, the presence of an apical plate, and by its tendency to develop a raised median septum at the anterior end of the median ridge in the brachial valve. From *Fascicostella* it is also readily distinguished by its much finer and non-fasciculate ribbing.

Species assigned to Visbyella.

Orthis visbyensis Lindström 1861, p. 366, pl. xii, fig. 8.

Dalmanella visbyensis var. *nana* McLearn 1924, p. 55, pl. 3, figs. 10–17.

Parnorthis visbyensis (Lindström) var. *pygmaea* Whittard and Barker 1950, p. 575, pl. viii, figs. 9–15.

Visbyella cummockensis sp. nov.

Distribution and derivation of Visbyella. Species of *Visbyella* occur in Silurian beds of late Llandoveryan age in Gotland (C₆), Britain (C₃ to C₆), Nova Scotia (middle member of the Ross Brook Formation which is considered to be C₁–C₅), southern New Brunswick (Long Reach Formation, C₆ to early Wenlockian), and in beds of late Wenlockian age (*Monograptus testis* zone) in New South Wales.

The earliest known occurrence of *Visbyella* is thus C₃ but could be as early as C₁. The oldest species assignable to *Resserella* is from beds of C₁–C₂ age. It is thus not yet clear whether *Visbyella* is derived from *Resserella* but its more complex morphology suggests that this is more likely than that *Resserella* was derived from *Visbyella*. Alternatively, they may both have been derived from an unknown ancestor of earlier Llandoveryan age.

Visbyella visbyensis (Lindström)

Plate 60, figs. 1–9

1861 *Orthis visbyensis* Lindström, p. 366, pl. 12, fig. 8.

1932 *Parnorthis visbyensis* (Lindström); Schuchert and Cooper, p. 129, pl. 21, figs. 1, 6, 8, 11, 12, and 15.

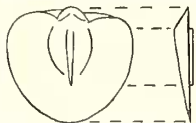

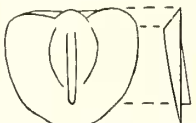
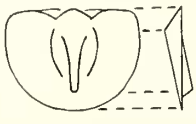
Diagnosis. Relatively large, finely costellate *Visbyella* with beak of pedicle valve distinctly overhanging the brachial valve. Median ridge in brachial valve not raised or septate at anterior extremity. Pedicle valve bears a narrow median depression.

Comparison. Comparison with other species of *Visbyella* follows their diagnoses. See also text-fig. 1, which summarizes the diagnostic characters of these species.

Description. Plano-convex to slightly concavo-convex, with sub-circular to elongately shield-shaped outline. Length slightly greater than width, and twice the thickness. Hinge line straight, equal to about two-thirds greatest width, which is at almost two-thirds

length. Cardinal angles only slightly rounded, lateral margins gently curved, sub-parallel, and anterior margin strongly rounded. Anterior third of the shell has a semicircular outline.

Pedicle valve projects one-quarter total length posterior to hinge line, with a very incurved beak, which overhangs the brachial valve. Anterior commissure crenulate, and rectimarginate. Lateral commissures straight. Costellae fine, rounded, increasing by bifurcation.

	BRACHIAL VALVE MEDIAN RIDGE Tap View Side View	BRACHIOPHORES	COSTELLAE	SIZE	SULCUS	OUTLINE	PEDICLE VALVE BEAK	
V. VISBYENSIS		Thin moderately divergent	Fine	Large	Weak	Subcircular to-elongate Shield shaped	Strongly incurved	narrow median depression in pedicle valve
V. PYGMAEA		Thin moderately divergent	Coarse	Small	Strong	Sub triangular	Fairly strongly incurved	
V. NANA		Thick very divergent	Medium coarse	Large	Strong	Sub triangular	Not strongly incurved	
V. CUMNOCKENSIS		Thick moderately divergent	Coarse	Very small	Weak	Semi circular	Not strongly incurved	

TEXT-FIG. 1. Comparison of species of *Visbyella*.

Exterior of pedicle valve. Strongly convex, with curvature decreasing slightly towards anterior margin and increasing over the strongly incurved beak. A faint, narrow median depression, increasing in depth and width anteriorly, marks the mid-line in some shells. The interarea is apsacine anteriorly, but curves strongly so that the posterior portion curves antero-dorsally beyond the commissural plane. Lateral margins of interarea very sharp. Delthyrium triangular, the margins diverging at 65° , usually open, but rarely having a small apical plate, and blocked by the large complex myophore of the cardinal process. Costellae fine, 4 per mm. at 5 mm. length, about 80 per 9 mm. wide shell.

Exterior of brachial valve. Plane, with shallow median sulcus, widening anteriorly and becoming flat or even slightly raised in the median area. In larger shells the effect of this slight sulcus is masked by a general flattening of the valve, which may even become slightly concave.

Interarea half as long as that of the pedicle valve, plane, hypercline. Notothyrium widely triangular, margins diverging more than 90° , open, filled completely by the large protruding myophore of the cardinal process, which also partially occupies the opposing

delthyrium. Branching pattern of costellae in median area of valve asymmetrical with successive branches directed alternately to left and right of preceding rib.

Interior of pedicle valve. The weakly impressed muscle field extends between a third and a half of the valve length, ending only slightly anterior to the teeth. In larger specimens, a low narrow rounded median ridge extends across the concave floor of the delthyrial cavity to just beyond mid-length. Relatively wide, shallow diductor impressions flank the median ridge. Slightly divergent thick dental lamellae extend from the margins of the delthyrium to meet the walls of the delthyrial cavity at about half their height. They bound deep lateral cavities which extend beneath the interarea and support moderately large triangular teeth. The teeth have a characteristic cross-section resembling an inverted V. They bear relatively wide, laterally inclined accessory sockets posteriorly, and are wider than long. They project further anteriorly than the short dental lamellae. Crural fossettes are indistinct.

Interior of brachial valve. The well-impressed adductor muscle field which is a third as wide and two-thirds as long as the valve, is slightly elevated on a low platform, and bounded by raised margins, which emphasize its sub-elliptical shape. A rounded median ridge, a sixth as broad as the muscle field, becomes slightly narrower as it passes between the anterior pair of impressions.

The anterior impressions are separated from the posterior pair by oblique ridges directed antero-laterally from the median ridge. The anterior impressions are smaller than the posterior pair. The brachiophores are thin plates, slightly divergent but well separated from each other by the wide median ridge. They project normal to the commissural plane, and have very steep anterior edges. The lateral faces of the brachiophores curve smoothly into the floor of the sockets which are also directed normal to the commissural plane and extend beneath the hypercline interarea. The crenulated sockets are supported on socket pads which merge into the bases of the brachiophores. The cardinal process consists of an indistinct shaft lying along the upraised median ridge between the brachiophores, and a distinctive trilobed myophore.

The median ridge and shaft become wide and flattened as they merge into the myophore which is so aligned that the typical crenulated posterior face of most resserellids is here turned through 90°. The heavily crenulated face is thus almost in the commissural plane, and is visible from the exterior of the brachial valve, projecting clear from the notothyrium.

Crenulations of the shell margin are short, strong, rounded, and separated by narrow, deep interspaces.

Type specimens. This species was described by Lindström 1861, pp. 366–7 and figured pl. xii, fig. 8. No holotype was designated. Specimens numbered Br. 102307–11 of the Swedish Museum of Natural History, Stockholm, are syntypes. According to Lindström's label they were collected from 'Gotland Wisby a'. According to Hede 1956, p. 411, Lindström distinguished three subdivisions of his 'Wisbygruppen'. In ascending order these were designated a, b, and c. These deposits are now referred to respectively as Lower Visby Marl, Upper Visby Marl, and the Hogklint group. It would appear, therefore, that the syntypes were obtained from the Lower Visby Marl which is considered (Hede 1956, p. 214) to be of late Llandoverian age and is of C₆ age as indicated by the presence of *Costistricklandia lirata*. The overlying Upper Visby Marl contains late Llandoverian graptolites.

One of the syntypes, specimen no. Br. 102310, a whole shell, which most closely matches Lindström's fig. 8, is here designated the lectotype. Specimens Br. 102307, Br. 102308, Br. 102309, and Br. 102311 are designated paratypes.

Distribution. *V. visbyensis* occurs in the Lower and Upper Visby Marls of Gotland. Lindström, 1861, pp. 367 and 381, showed this species occurring in groups a and b of his 'Wisby-gruppen'.

According to Regnell and Hede 1960, pp. 51–52, these formations are both of late Llandoveryan age and are now known to be C₆.

V. cf. visbyensis is recorded from the Long Reach Formation (C₆ to early Wenlockian) of southern New Brunswick, Canada, G.S.C. Loc. 55061 (Boucot, Johnson, Harper, and Walmsley 1966, pp. 14–15).

Visbyella pygmaea (Whittard and Barker)

Plate 61, figs. 1–5

1950 *Parmorthis visbyensis* var. *pygmaea* Whittard and Barker, p. 575, pl. 8, figs. 9–15.

Diagnosis. Small, sulcate, relatively coarsely costellate *Visbyella* with sub-triangular brachial valve in which the adductor muscle field is raised on a distinct platform and the median ridge is not elevated anteriorly. Interarea of pedicle valve, long, incurved, overhanging hinge line.

Comparison. *V. pygmaea* is closest to *V. visbyensis*, neither of which develops an anteriorly raised median septum in the brachial valve. From *V. visbyensis*, *V. pygmaea* is distinguished by its small size, its fewer and coarser ribs, the more triangular outline of the brachial valve, and by the less incurved beak of the pedicle valve.

Type specimens. In the Geological Survey Museum London. Holotype: GSM 82546 whole shell. Paratypes: GSM 82547 pedicle valve; GSM 82548 internal mould of pedicle valve; GSM 82549 brachial valve; GSM 82550 internal mould of brachial valve.

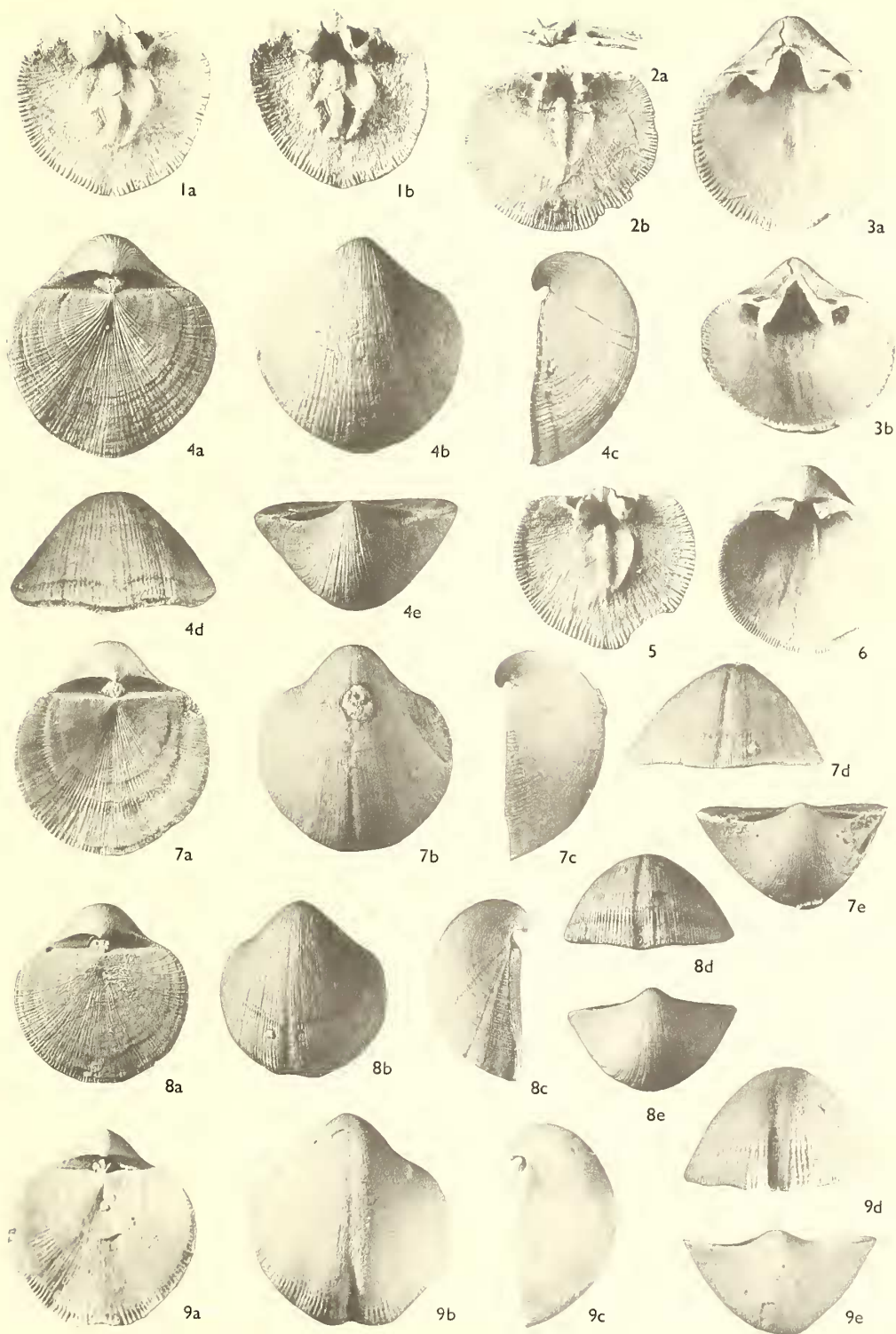
Distribution. In addition to the type material from the Purple Shales (Late Llandoveryan) of Shropshire, *V. pygmaea* is known from beds of Late Llandoveryan age ranging from C₃–C₆, from the following localities in Britain:

Llandovery district, Carmarthenshire

C₃ beds in roadside exposure on the Llandovery to Myddfai road, 300 yd. north of Cefn-cerig, Llandovery district, Carmarthenshire, grid reference SN 7752/3257, U.S.N.M. locality 10257.

EXPLANATION OF PLATE 60

Figs. 1–9. *Visbyella visbyensis* (Lindström). 1a, Interior of brachial valve, specimen no. USNM 157830 (×3). 1b, Slightly oblique view of same specimen to show brachiophore. 2a–b, Posterior and interior of brachial valve, specimen no. USNM 157831 (×3). 3a–b, Interior and anterior view of pedicle valve, specimen no. USNM 157832 (×3). 4a–e, Dorsal, ventral, lateral, anterior, and posterior views of whole shell, specimen no. USNM 157833 (×3). 5, Interior of brachial valve, specimen no. USNM 157834 (×3). 6, Interior of pedicle valve, specimen no. USNM 157835 (×1½). 7a–e, Dorsal, ventral, lateral, anterior, and posterior views of whole shell, specimen no. USNM 157836 (×2). 8a–e, Dorsal, ventral, lateral, anterior, and posterior views of whole shell, specimen no. USNM 157837 (×2). 9a–e, Dorsal, ventral, lateral, anterior, and posterior views of lectotype, Swedish Museum Natural History, Stockholm, specimen no. Br. 102310. Lower Visby Marl, Gotland (×2). 1a–b, 2a–b, and 6, Lower Visby Marl, shore exposure between 1.0 and 1.8 km. NNE. of the NW. corner of the city wall of Visby, Gotland. Collected by Dr. Hede. 3a–b, 4a–e, 5, 7a–e, and 8a–e, Upper Visby Marl, shore exposure at Gnisvårds flge., Tofta parish, Klintehamn Sheet, Gotland. Collected by Dr. Boucot, Loc. No. 56G47. USNM numbers refer to United States National Museum, Washington.



C₄ beds in disused quarry immediately west of the Myddfai to Gorllwyn-fawr road and west-northwest of Gorllwyn-fach, Myddfai, Llandovery district, Carmarthenshire, grid reference SN 7590/2966, U.S.N.M. locality 10256.

C₅ beds in the roadside exposure on the Llandovery to Myddfai road, 200 ft. west of Cefn-cerig, Llandovery district, Carmarthenshire, grid reference SN 7745/3231, U.S.N.M. locality 10259.

Shropshire

C₅ beds (with *Eocoelia curtisi*), stream section in Boathouse Coppice, 200 ft. upstream from a railway bridge, Buildwas Park, Shropshire, grid reference SJ 6206/0390, U.S.N.M. locality 10248.

Woolhope Inlier

C₆ beds in the Lower Haugh Wood Beds about 30–40 ft. below Woolhope Limestone, in trackside exposure in Kidley Coppice, 450 yd. north, 27° east of Iron House, Mordiford, Herefordshire, grid reference SO 5804/3730, U.S.N.M. locality 10230.

May Hill Inlier

C₆ beds in May Hill Inlier, Hay Farm Brook section, 465 yd. west of Hay Farm, north-east side of May Hill in Yartleton Beds, grid reference SO 6927/2263, U.S.N.M. locality 10226.

Tortworth Inlier

C₆ beds, exposure created by the straightening of route A38, 170 ft. north of the old A38 bridge over the Little Avon River, Woodford, Gloucestershire, grid reference ST 6789/9754, U.S.N.M. locality 10215.

Galway Co., Ireland

In Finny School Beds, Crumlin Valley, 550 yd. north-east of Crumlin West, at waterfall in middle of field, Galway Co., Ireland, U.S.N.M. locality 10872.

Visbyella nana (McLearn)

Plate 62, figs. 1–8

1924 *Dalmanella conservatrix* McLearn, pl. 2, fig. 26.

1924 *Dalmanella wisbyensis* var. *nana* McLearn, p. 55, pl. 3, figs. 10–17.

Diagnosis. Distinctly sulcate *Visbyella* with triangular shield-shaped outline, and medium coarse costellae. Beak of pedicle valve does not overhang brachial valve and the median ridge of the brachial valve is uniform in width but raised anteriorly.

Comparison. *V. nana* differs from *V. visbyensis* in its distinctly sulcate brachial valve, which may be very slightly convex. The narrow median depression along the arch of the pedicle valve and correspondingly slightly raised median area in the sulcus of the brachial valve which are commonly present in *V. visbyensis* are both absent from *V. nana*, which is also distinguished by its coarser ribbing and considerably less incurved beak of the pedicle valve. Internally, *V. nana* is distinguished from *V. visbyensis* by its median ridge in the brachial valve which, as it extends anterior to the muscle field, is elevated into a median septum. In the pedicle valve the median ridge is more pronounced than in *V. visbyensis*.

Description. Plano-convex to gently concavo-convex or very unequally biconvex; dorsally sulcate; outline semi-elliptical to shield-shaped with sharply obtuse cardinal

angles. Lateral and anterior commissures curved and crenulate, anterior commissure sulcate. Hinge line straight, slightly less than the greatest width which is slightly posterior to mid-length. Width varies from three-quarters of length to equal to length; thickness about half the length.

Exterior of pedicle valve. Strongly convex; surface of valve strongly arched along plane of symmetry and slopes off abruptly lateral to it. Beak strongly curved, dorsally directed at apex, and projects one-fifth the total length posterior to the hinge line. Interarea strongly curved concave, apsacline, a quarter as high as long. Delthyrium triangular enclosing about 60° , apical one-third closed by an apical plate which is gently convex outwards and has an anterior margin which is strongly concave towards the hinge line. Delthyrium partly occupied by posterior end of cardinal process.

Exterior of brachial valve. Valve flat or only slightly convex in posterior portion and may be flat or gently concave along periphery. Wide, deep median sulcus widens from umbo to anterior margin where it is half as wide as the greatest width. Interarea flat, erect to hypercline, half as high as pedicle valve interarea; notothyrium triangular enclosing about 110° , occupied by the posterior end of the cardinal process. Branching pattern of costellae in median area of valve asymmetrical with successive branches directed alternately to left and right of preceding rib, resulting in many specimens in a smooth triangular median area.

Interior of pedicle valve. Delthyrial cavity deep; muscle field cordate in outline, extends a third to half the length of the valve and is three-fifths to four-fifths as wide as long. Diductor scars triangular in outline with rounded anterior margins, separated by a raised median area of uniform width which is rounded in cross-section and about a quarter as wide as the muscle field. Narrow rounded depressions of uniform width may be present on each side of the raised median area medial to the diductor scars. The raised median area in some cases extends anterior to the muscle field and tapers in height

EXPLANATION OF PLATE 61

Figs. 1-5. *Visbyella pygmaea* (Whittard and Barker). 1a-e, Purple Shales $\frac{1}{3}$ mile NE. of Brook House, Hughley, Shropshire. Dorsal, ventral, lateral, anterior, and posterior views of specimen no. GSM 82546 (holotype) ($\times 5$). 2. Purple Shales, Onny River section, Shropshire. Internal mould of pedicle valve. Specimen no. GSM 82548 (paratype) ($\times 5$). 3. Purple Shales, Harley Brook, 200 yd. NNE. of Domas, Shropshire. Interior of pedicle valve. Specimen no. GSM 82547 (paratype) ($\times 4$). 4. Purple Shales, Onny River section, Shropshire. Interior of brachial valve. Specimen no. GSM 82549 (paratype) ($\times 5$). 5. Purple Shales, Onny River section, Shropshire. Internal mould of brachial valve. Specimen no. GSM 82550 (paratype) ($\times 5$).

Figs. 6-12. *Visbyella cumnockensis* sp. nov. Manildra Formation, *Monograptus testis* horizon, 800 yd. N. of Baldry road, $1\frac{1}{2}$ miles W. of Cumnock, N.S.W., Australia. 6. Internal mould of both valves in contact. Specimen no. SU 19511 (holotype) ($\times 8$). 7. Internal mould of both valves in contact. Specimen no. SU 19512 (paratype) ($\times 8$). 8. Internal mould of both valves in contact. Specimen no. SU 19513 (paratype) ($\times 8$). 9. External mould of both valves in contact. Specimen no. SU 19514 (paratype) ($\times 8$). 10. External mould of both valves in contact. Specimen no. SU 19516 (paratype) ($\times 8$). 11. External mould of brachial valve. Specimen no. SU 19517 (paratype) ($\times 8$). 12. External mould of brachial valve. Specimen no. SU 19518 (paratype) ($\times 8$).

